TRACES OF GLACIAL MAN IN OHIO.

TRENTON and the Delaware Valley no longer have exclusive claims to reputed evidences of glacial man. For a number of years reports have come from the West of finds of implements in ice-age drift. Miss Babbitt in Minnesota, Cresson in Indiana and Metz and Mills in Ohio, have in turn announced the discovery of specimens of these rare and precious mementos of antiquity. I have already, in papers published in THE JOURNAL OF GEOLOGY and in the *American Geologist*, raised questions as to the proper interpretation of the finds in Trenton and at Little Falls, Minnesota. A brief study of the Ohio finds may now be undertaken with a view of presenting and weighing such doubts as may have arisen with respect to the value of the evidence furnished by them. I have endeavored in this, as in the other cases, to keep well within the bounds of legitimate criticism, desiring to allow all that can be justly claimed for the evidence presented in support of the theory of a glacial paleolithic man in America. In dealing with this subject, however, I have found it necessary to keep in mind the fact that the evidence to be considered has been collected and presented by advocates of the paleolithic theory who have welcomed finds without critical scrutiny, and have reached and presented conclusions as much because they were in the line of the expected and desired, as because they were actually susceptible of demonstration. The advocates of the theory have naturally taken every opportunity to emphasize the importance of the evidence collected as viewed from their own standpoint. To insure correct final judgment it is necessary that other points of view be taken and that the evidence be subjected to every possible test. I shall confine myself to fields in which I have made personal and most careful observations. I do not desire to secure the acceptance as final of any particular view with respect to the history of early man in America. I am not intro-

ducing or advocating a theory but attempting to insure the non-acceptance of any theory, howsoever plausible, that is not supported by conclusive proofs. Others have undertaken to show how much proof Ohio has furnished in support of a particular hypothesis; they cannot now object to my attempting to show how insignificant this proof really is.

At the meeting of the American Association for the Advancement of Science in Washington, in 1891, much attention was paid to glacial geology, and one paper by Mr. Frank Leverett, of the Geological Survey, treated of the gravels of Loveland, Ohio, and of the finds of implements in them by Dr. C. L. Metz. Mr. Leverett was then about to return to Ohio and I resolved to accompany him to the Little Miami Valley with a view of making a brief preliminary study of the gravels and their contents. A week later Dr. Metz joined us at Loveland, and we proceeded at once to the great gravel pits just west of the village. Gravel was then being taken by the Baltimore & Ohio Railway Company from the south side of the road, two hundred yards beyond the bridge, but the old pit is a little farther on and on the north side of the road, the excavation running into the high terrace from the track at an oblique angle. The excavation is upward of two hundred yards long, and is from two hundred to three hundred feet wide, and has an average depth of perhaps twenty-five feet. The west wall had not been worked recently, and was reduced by erosion to a steep slope covered with vegetation. The curved wall of the east side was thirty or more feet high and very steep, affording an excellent exposure of the gravels; these consisted of very coarse material laid down in heavy irregular beds. At least one-fourth of the mass consisted of sub-angular or but imperfectly rounded slabs and flattish masses of limestone, which lay flat or with a slight inclination toward the river. The larger slabs, which were often as much as two feet or more across, projected like steps or shelves from the wall. The remainder of the deposit consisted of smaller rounded masses and bits of limestone; of masses, bowlders and pebbles of granitic rock constituting perhaps one-

twentieth of the deposit, and of gravel, sand and calcareous powder.

There were, in places, indications of rude lenticular bedding of these materials with a pretty uniform general inclination toward the channel of the river. The appearance of newness exhibited by these deposits was wonderful; the surfaces of the stones were smooth and clean, and many of the interspaces were open as if formed but yesterday. A closer examination showed, however, that this appearance of newness was partly due to the fact that the waters charged with calcareous matter penetrated the superficial beds, partially setting the constituent parts and in a measure sealing the apertures, thus preventing the complete settling and filling that otherwise would have taken place. The constitution and conditions were pretty uniform throughout the section, save at the top where there was a deposit from two to four feet deep of ferruginous sandy loam, containing some fragments, pebbles and bowlders of several varieties of stone.

After three visits, and the most careful but entirely fruitless search for relics of art from bottom to top of the gravel walls, I found myself wondering whether there had not been some mistake, whether the objects found were really tools, or whether the collector had not mistaken materials descended from the surface deposits for gravel in place. It is unfortunate that the statements of collectors in such cases, correct or incorrect, cannot readily be subjected to competent tests of verity; we must be content with hedging them about with all available restrictions in the way of negative evidence.

Having, during the first visit, examined the site at some length, we proceeded to the office of Dr. Metz, in Madisonville, and were shown two objects obtained from the pit at a depth of about twenty-five feet beneath the surface. The smaller of these, a dark flattish piece of cherty, slightly water-worn stone, was rudely flaked along one edge, but the evidence of design was not at all convincing, and it seems useless to place the specimen in evidence. The other object was apparently a work of art, exhibiting decided indications of design. It was found in

the main gravel pit about twenty-five feet from the surface, by Dr. Metz, who expresses his full belief that it was in place in the gravels when found. A third slightly flaked stone from the same locality and position had been forwarded to the Peabody Museum at Cambridge. On examining this specimen at a subsequent date I found that it has no features that can with certainty be described as artificial.

It is not from a desire to discredit the observations of Dr. Metz, who is a most reputable and more than usually capable observer, that I raise the question of the verity of these finds. It is essential, in a case where so much depends on the finding of a single specimen, that every observation relating to it should be placed upon record in such a way that, in the future, judgments as to the value of the evidence may not be based entirely upon the testimony of a single observer whose acquirements may be restricted or whose preconceived notions may give a very marked bias to his observations and deductions.

Referring to the Loveland site, it may be remarked in the first place that it seems improbable that man would have occupied an area overrun by torrents capable of transporting, and transporting almost exclusively, the coarse materials forming these deposits, and the chances of the preservation of artificial features of specimens brought by floods from the valley above are extremely slight.[1] Of course, if man existed here during the glacial period, he may have sought the raw material for his rude arts on the banks of this stream during the periods of of low water and may have thus left the refuse of his shaping operations at almost any point; but a single specimen cannot, considering possible errors of observation, be regarded as sufficient for the establishment of such a conclusion.

In the second place, I may mention the fact that on carefully examining the Loveland specimen, I found it partly covered with dark, well-compacted earth, resembling the soil of the surface of

[1] The edge of the continental ice sheet was, according to Mr. Leverett, only about eight miles distant when these gravels were formed, which makes the probability of finding implements here still slighter.

the terrace, rather than the light-colored, fine-grained calcareous powder characterizing the matrix, such as there is, of the gravel deposits. It seems to me that there is in this observation, made also by Mr. Leverett, and still subject to verification if the specimen has not yet been cleaned, sufficient ground for raising the question as to whether it is possible that Dr. Metz could have mistaken a surface mass, descended into the pit from above, for gravel in place. Dr. Metz, or any other observer not a professional student of geologic phenomena, especially of talus phenomena, involving materials subject to resetting after degradation, or to sliding *en masse*, could readily be excused for making a mistake of this kind. Lest this suspicion of error should seem unfounded or uncalled for, I have prepared two sections, Figs. 1 and 2, which illustrate some of the many dangers besetting the way of gravel searchers. In Fig. 1, an ordinary profile, resulting from the removal of gravels for railroad ballast, is shown. Deserted by the workmen for a day or a week, objects from the surface deposits, *A*, may have fallen into the pit resting at *B*. The sliding of the mass, *a b*, might cover them to the depth of several feet, *C*, Fig. 2, and the effects of disturbance upon the surface are soon obscured or obliterated by weathering. Suppose now that Dr. Metz, or any one else, should appear upon the scene as the fallen mass is removed and penetrated by workmen, and should witness the uncovering of art forms at *D*, twenty-five feet beneath the surface of the terrace. It is vain to hold that there is no danger of mistake in such a case; the chances of error are really very great, and a little slip like this in observation would falsify the chronology of human history in this valley to the extent of some thousands of years.

It may be remarked that the terraces of the Little Miami were for a long period occupied by mound-building tribes whose implements and refuse of manufacture are scattered everywhere, and it is entirely within the range of possibility that such a partially worked specimen as this should have been left by them in the surface loams on the site of this pit at Loveland.

As to the nature of the object itself, a number of questions

may be raised, and we are justified in making all possible inquiries. It is a pick-like object, some six inches long, and perhaps two inches thick toward the larger end. The head is rounded, as if intended to fit the hand, and there is even an appearance, deceptive, no doubt, as will appear further on, of abrasion by use. The sides are neatly flaked, the apparent result of blows by a hammer, many of which seem to have served only to batter the edges, while others appear to have removed a series of flakes extending along the shaft from the head to near the point. The smaller end of the object is worthy of especial notice; the point, which probably was originally sharply pyramidal, has been removed by an oblique fracture, leaving a clean, unworn surface. A portion of the surface adjacent to the truncated point has not been shaped by flaking, but retains the original minutely granular weathered surface, indicating that the stone before flaking or remodeling was already pointed. The object was therefore not used after the breaking of the point, as the unworn fracture shows, and the presence of the unaltered original surface adjacent to the present point would seem to prove that it never was subjected to use. The material appears to be a fine-grained, light-colored limestone, having a conchoidal fracture. It is soft and brittle, and is not likely to have been employed in making tools, and especially pick-like tools. This observation leads to an inquiry as to whether it is possible that the flaking could have been the result of natural agencies, such, for instance, as the crushing and abrading forces exerted by moving ice. Could a pointed bit or mass of brittle limestone have been so squeezed between moving impinging rocks as to remove these flakes and to produce the battered and rounded effect seen upon the edges and head, respectively, of this object without affecting the point, save to break it, and without breaking the shaft elsewhere? That natural forces do occasionally produce forms resembling those of art is well known, and that archæologists have at times been rash in accepting such as artificial cannot be denied.

To more fully inform myself upon this topic I made careful examinations of the contents of the moraine from which por-

tions, at least, of these gravels descended. I was somewhat surprised with the results, which proved so interesting and suggestive that they may well be referred to in this place. In a railroad cut recently made through morainal deposits near South Lebanon, about eight miles north of Loveland, I found numerous pieces of this brittle limestone, varying from minute bits to masses a foot or more in greatest dimension, showing traces of fracture and flaking resembling somewhat closely those of the implement or object found by Dr. Metz at Loveland. Indeed, some of these specimens are so well flaked that I would, under ordinary circumstances, not hesitate to call them artificial. In fact, all may be artificial, although the shapes are often eccentric, and the size, in cases, is greater than in any known flaked tool. It is a significant fact that nearly all the stones found in the deposit are covered with glacial striæ, and some of the conchoidal faces of the implement-like objects are scratched, through movements of the ice. It is true that man may have lived or hunted on or near the ice, and his tools or the refuse from their manufacture may have been taken up by the ice, passing afterwards into the moraine; but that they should enter the ice in numbers, and so become striated through its movements, is highly improbable. The Loveland specimen has, however, a more decidedly artificial character than any of these, and were its inclusion in the gravels fully verified, and were it not alone and practically unsupported by other finds, it could well be accepted as important evidence of glacial occupation by a stone-flaking people.

Besides the Loveland finds, Dr. Metz obtained a specimen of rudely flaked black chert from a cistern which he was sinking in Madisonville, Ohio. It was found at the surface of, or slightly imbedded in, gravel beneath a bed of silt eight feet thick.[1] Dr. Metz is a careful observer, and it is hard to believe that he would have permitted himself to be deceived although all must

[1] Putnam, F. W. Proc. Boston Soc. Nat. Hist., Vol. XXIII, p. 242.
Wright, G. F. Ice Age, pp. 530-532.
Leverett, Frank. Am. Geologist, March 1893, p. 187. According to Mr. Leverett it is not certain that these silts belong to the ice age, and if not, the find is no evidence of glacial man, whatever else it may signify.

admit the possibility of such deception. I have examined the specimen, now in the Peabody Museum, and find it to be identical in every essential feature with typical rejects of the modern blade-maker, lacking the least indication of specialization. It is not safe to call it an implement, no matter what its age, and to present it as evidence of paleolithic culture is little short of folly.

The discovery of a number of ancient hearths on the banks of Little Miami river was announced several years ago, and may be referred to in this place, since they were associated with deposits of ancient-appearing gravel. Professor Putnam gives the following information in regard to them: An exploring party "discovered five ancient hearths half a mile down the river from the Turner group of earthworks. These hearths were exposed by the river cutting away its bank. The lowest of the five . . . is thirteen feet below the surface of the bottom land, and rests upon a layer of gravel seven inches thick, upon which rest ten feet of alluvial deposit. This is by far the lowest and most ancient of the many hearths which from time to time have been exposed by the action of the river, as first noticed several years ago by Dr. C. L. Metz, who has examined a number of these ancient fire-places, and on one found fragments of pottery, which he sent to the Museum last year. These hearths are made of small boulders, in each case covering an area of several square feet. These stones are burnt, and many are splintered by heat. Upon the stones forming this oldest hearth was a considerable quantity of ashes and charcoal, but no other evidence of the work of man. These hearths furnish evidence of the occupation of the bottom land at different intervals during the formation of this deep deposit, filling the valley for miles in extent. That in this lowest hearth we have a considerable antiquity is self-evident; but how long after the formation of the glacial moraine, from which the gravel overlying it was derived, will only be determined by a careful study of the geology of the whole valley.[1]

[1] Putnam, F. W., 23d and 24th Annual Reports of Peabody Museum, p. 92.

In 1891 I visited this site with Mr. Frank Leverett. Traces of the fire-marked stones were found, but the waters had removed the hearths previously observed. A critical examination of the sedimentary deposits leaves the impression that they are quite modern. The upper surface is but little above the present flood plain, and has the appearance of a modern alluvial deposit of black, loamy earth, including thin irregular layers of fine gravels. I see no reason, considering the facility of mutation characterizing such deposits, why the hearths may not have belonged to the occupants of the site of the noted Turner group of mounds near by. It is seen from Professor Putnam's report that there were many hearths in and beneath these works. "An examination was also made of the surrounding embankment of the work, and much to our surprise portions of it were found to cover large areas of burnt stones. Several of these old fireplaces were explored inch by inch with the trowel, and in the ashes and among the charcoal were found numerous pieces of the bones of various animals, many potsherds, flint chips, broken and perfect implements, ornaments of several kinds, pieces of mica, etc., all similar to what has been found in previous years at other places in this interesting group of earthworks."[1] It may, I believe, be taken for granted that these hearths, notwithstanding their intimate relations with deposits of gravel, will never form any part of the evidence arrayed in support of an ice-age man or a paleolithic culture.

Another discovery, to which much attention has been given on account of its supposed bearing upon the paleolithic question, was made in 1889. Mr. W. C. Mills, of Newcomerstown, Tuscarawas county, Ohio, found a single specimen of chipped flint in an exposure of glacial gravel in that place. The specimen fell into the hands of Professor G. F. Wright, by whom it has been widely exhibited and published. A cut of it appeared in his "Man and the Glacial Period," from which work a brief extract may be given in this place. He states that Mr. Mills found this "finely shaped flint implement sixteen feet below the surface of the

[1] Putnam, F. W., 23d and 24th Annual Reports Peabody Museum, p. 94.

terrace of glacial gravel which lines the margin of the Tuscarawas valley. Mr. Mills was not aware of the importance of this discovery until meeting with me some months later, when he described the situation to me, and soon after sent the implement for examination. In company with Judge C. C. Baldwin, President of the Western Reserve Historical Society, and several others, a visit was made to Mr. Mills, and we carefully examined the gravel-pit in which the implement occurred, and collected evidence which was abundant to corroborate all his statements. The implement in question is made from a peculiar flint which is found in the Lower Mercer limestone, of which there are outcrops a few miles distant; and it resembles in so many ways the typical implements found by Boucher de Perthes, at Abbeville, that, except for the difference in the material from which it is made, it would be impossible to distinguish it from them. The similarity of pattern is too minute to have originated except from imitation."[1]

In another place Dr. Wright gives a statement of Mr. Mills in regard to the specimen, from which I quote the following additional details: "While examining the different strata of the gravel, I found the specimen that you have before you fifteen feet from the surface of the terrace. The bank was almost perpendicular at this time, exposing a front of about twenty feet. The small part of the bank was in place in the side of the terrace, until I struck it with my walking-cane, when a space of about six feet in length by two feet in height tumbled down, exposing to view the specimen. At first I recognized the peculiar shape and glossy appearance of the specimen, such as were characteristic of paleolithic specimens described to me by Professor Edward Orton, while I was a student at the Ohio State University."[2] Mr. Mills has, I believe, published nothing save through Professor Wright, and we must therefore take the above as the authoritative statements of the finding. A re-statement embodying additional minor details and placing the evidence fully and

[1] Wright, G. F. "Man and the Glacial Period," p. 251.

[2] Wright, G. F. Report of Western Reserve Historical Society, Dec. 12, 1890.

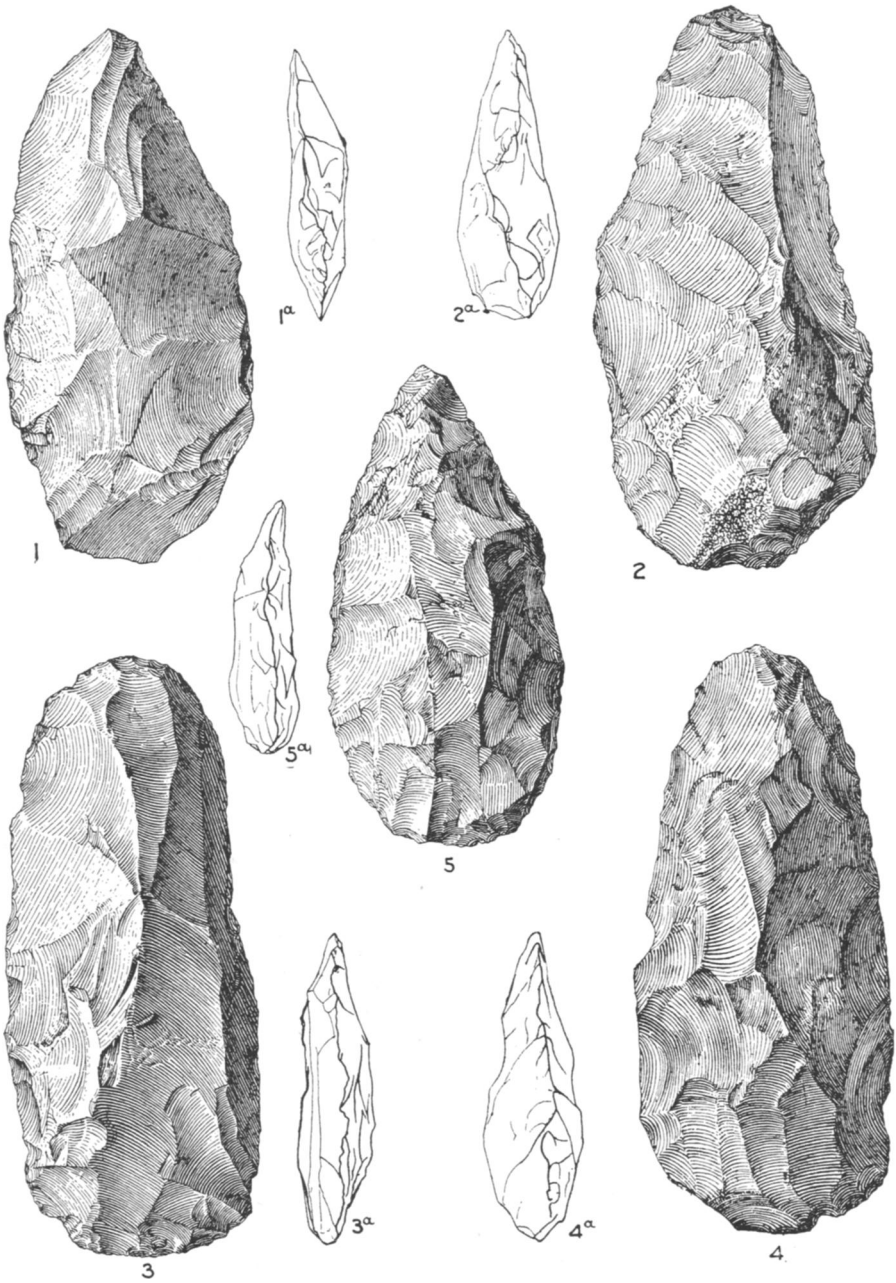


Plate illustrating the Newcomerstown "paleolith," copied with all possible care from the cut in "Man and the Glacial Period," and four ordinary rejects of the blade-maker, the latter obtained in three cases from modern flint shops in the same region, and in the fourth case directly traceable to the same shops. The separation of the "implement" of glacial age and paleolithic type from the modern rejects is left to the reader. Three-fourths actual size; the profiles on a still smaller scale.

finally upon record, an excellent thing to do, appeared in *Science* for February 3, 1893.

The question may now be raised as to the value to be attached to this find, since the observation is one upon which much is made to depend. In September, 1892, I visited Newcomerstown and examined the site of the discovery of this interesting object, which is shown in the accompanying plate. The town is built along the margin and on the slopes of a glacial terrace, formed about the end of a spur of the hills which projects into the valley on the north side of the Tuscarawas. The exposures of the gravels in the railway ballast pit are excellent, showing them to be ordinary irregularly bedded deposits of sand and gravel. It is a sufficiently promising place for the recovery of such implements or objects as the gravels may happen to contain. The formations are very loosely bedded, and it takes but a short time after the desertion of the site by workmen, especially if the weather is wet, to cover the exposures with talus. Large masses are liable to fall, carrying with them all objects resting upon and near the surface. A collector not on his guard, or not appreciating the nature or significance of finds, might readily, when afterwards questioned about the matter, give a faulty diagnosis of the conditions of discovery. The case in hand is one in which double assurance of verity is called for, yet it is one in which uncertainty resulting from the lack of experience and possible, I may say probable, carelessness of the collector is augmented by the treachery of the gravels. This uncertainty is again emphasized by the discovery, made at the time of my visit, that this terrace is probably an old Indian village site, and certainly a shop site where flint was flaked, many rejects and flakes occurring upon the very brink of the pit. Of course I found no duplicate of the specimen in question, for duplicates are *raræ aves;* but I saw enough to convince me of the danger of hastily and unqualifiedly making use of the observation made by Mr. Mills, especially since the material of which this object is made occurs in the neighborhood, and must have been used by the Indians inhabiting this site.

There is no doubt that this specimen suggests, perhaps more decidedly than any other American so-called gravel implement thus far collected, a resemblance to one of the well-known European types of implements. This is noted by Professor Wright, and may be regarded by many as a point worthy of attention. We must, however, look with extreme caution upon deductions drawn from or depending upon analogies of form. Close analogies of form between Indian rejects and some varieties of European paleolithic objects are too common to permit the attachment of much value to this feature of this or any other similar find. The remark of Professor Wright quoted above, that "the similarity of pattern is too minute to have originated except from imitation," is rather a novel statement, since no specimen of its type has been reported from the American gravels, and the Newcomerstown man could hardly have been familiar with European forms. The only available models would appear to be the Indian rejects of the valley of the Tuscarawas.

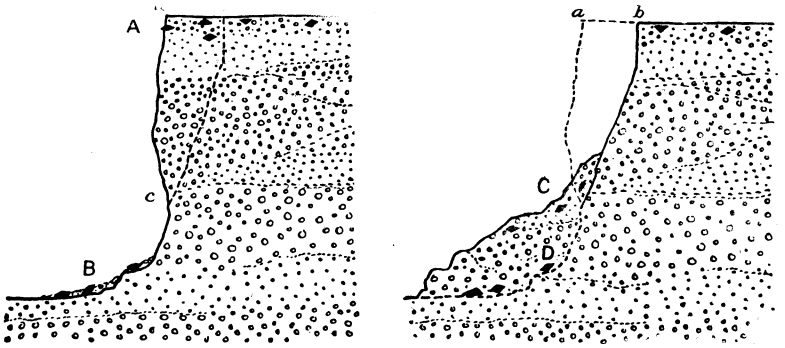
As to the surface polish, that is a common feature of the Ohio flints, and I have before me during this writing a tray of quarry rejects that have the same glazed effect. This is a characteristic of the stone, and has no bearing upon questions of age or use or culture, and must be considered as without significance in these connections.

Professor Wright is entirely satisfied with the results of his efforts to corroborate the statements of the collector. He has examined and reëxamined Mr. Mills, receiving every assurance of the verity of the find, but after all he really secures no additional assurance and can receive no fully satisfactory assurance that Mr. Mills was not in error. Professor Wright has visited and photographed the site and will speedily prepare a plate for publication,[1] for just what purpose, however, it is rather hard to see, since the nature of the gravels is not disputed, and a volume of photographs will not give additional weight to the proofs. A photograph made of the tree after the bird has flown will not help in determining the bird. No more will observations on Mr.

[1] Wright, G. F., Science, February 3, 1893.

Mills' moral character, his education or business reputation, diminish the danger of error. The specimen may not have been found in place notwithstanding all possible verification, and it may be a reject notwithstanding its resemblance to foreign types, and Professor Wright may be wrong in urging his conclusions upon the public, notwithstanding his painstaking efforts to secure all possible affirmative testimony.

It is nowhere stated that Mr. Mills actually picked the specimen out of the gravels; it was probably loose when he dis-



Figs. 1 and 2. Sections of wall of gravel-pit showing redistribution of surface objects by sliding masses. The dark figures represent objects of art.

covered it, but even if he could say that it was fixed in the gravel mass, the necessity of questioning the find would still exist. All the authentication Professor Wright can possibly secure will not enable him to determine whether Mr. Mills struck with his walking stick a small mass of the gravel in place at a depth of sixteen feet, or whether he was dealing with a mass which had slid with its inclusions of modern relics from the surface to a depth of sixteen feet, as indicated at C, Fig. 2. The object *may have been* in place, but can we afford to decide momentous questions upon the evidence furnished by a single specimen obtained under the conditions existing in this case, and by a collector who for months after the finding "was not aware of the importance" of the discovery?

At Warsaw, in Coshocton county, fifty miles west of Newcomerstown I visited an exposure of gravels in a railway cutting, the conditions being almost identical with those at Newcomerstown. The terrace, as in the other case, has been occupied by Indian flint workers, and being in the proximity of extensive flint quarries, there is much refuse of manufacture. I gathered a peck of turtle-backs and rude objects of paleolithic types from the level ground above, and in the wall of the gravel pit found several pieces, descended from the surface, that would be freely admitted into the paleolithic family by its sponsors. Work in the excavation had ceased several months before, and the face of the bluff, nearly thirty feet high and two hundred yards long, was well veneered more or less deeply with talus deposits, through which in places and especially near the top, the normal gravels could be seen. The redistributed deposits along the base of the steep slope were well reset, and from these I obtained a number of flaked flints; several of which were firmly imbedded, and two of them were removed from the gravel with some difficulty and with the aid of a pick, one twenty-five and the other twenty-seven feet beneath the surface of the terrace. The latter specimen is shown in the accompanying plate.

In studying this section at Warsaw I was led to realize the folly of hastily using inexpert evidence regarding the finding of relics of art in gravels. In a case like this even the experienced scientific observer, whose attention had not been definitely called to the nature and far reaching significance of such finds, might from a casual observation have recorded the recovery of one or more of these objects from the gravels. The danger would be greatly increased if the observer were only a relic hunter, or if he were convinced that the gravels at any depth might be expected to contain such objects. These specimens were in the gravels, firmly imbedded, and to all appearances this particular portion of the deposit was in a normal condition. Any one could here have dislodged a portion of the mass with his walking-stick, with fair prospect of finding a flaked stone of paleolithic type. I doubt very much if we are justified in using the casual obser-

vation of an inexpert collector at all in questions where there is no other well-established body of evidence with which to associate it. The function of such data does not extend legitimately beyond the confirming of testimony already well verified.

I present in the accompanying plate examples of the finds from the gravel talus and from the shops above. They correspond very closely in material and appearance with the Newcomerstown specimen, as will be apparent from an examination of the plate. The figures are presented without identification in order that the student may, by an effort to distinguish them, convince himself of the similarity of the supposed paleolith to the quarry-shop rejects of the region. I am not satisfied with the drawing of the former specimen which is a copy, the best that could be made, of the cut published in "Man and the Glacial Period." I desired to have a new drawing direct from the specimens, but a request looking to that end, made to Professor Wright, met with no response.

The four quarry-shop failures here shown are not rare finds with unusually implement-like features. They are everyday rejects, and four hundred could be presented as readily as four.

Summing up the evidence of gravel man in Ohio, assembling all of the finds of several earnest workers these many years — the fulfillment of Professor Wright's prophecy — we have to consider three specimens only. The finding of these objects seems ordinarily well attested, and there is not the least hint of deception or partial withholding of details of discovery. The specimen found by Dr. Metz in his cistern was eight feet deep, and on, or in, the surface of the gravel bed beneath eight feet of silt that may or may not be glacial. Eight feet is not a great depth, however, and we are justified, so long as the specimen stands alone, in expressing our fears that it might, through some unsuspected disturbance of the soil, artificial or natural, have been introduced or covered up to this depth at some date in the long period separating the ice age from the present. A number of agencies known to disturb the soil to considerable depths, are referred to in my paper on early man in Minnesota, in the April

number of *The American Geologist*, and Mr. Frank Leverett, in the March number of that journal, dwells at some length upon this subject. In response to an inquiry, I received the following note from Dr. C. Hart Merriam, the naturalist, on the burrowing of native animals:

"In reply to your inquiry respecting the depth to which our burrowing mammals penetrate, I regret to say that precise information on the subject is somewhat meager. A number of species, such as our woodchucks or marmots, skunks, foxes, coyotes, badgers and prairie dogs live in burrows of greater or less depth which they construct for themselves. In a few instances these burrows are known to extend to a depth of eight feet or more. One of the gophers is said to dig a spiral well fifteen feet deep. Badgers and prairie dogs are notorious diggers, making vast numbers of holes and bringing up immense quantities of material from unknown depths. Their burrows, moreover, are usually very steep, so that a stone or other object falling into one would descend to a considerable distance before being intercepted. Badgers and coyotes make very large holes, though small in comparison with those of the large wolf, which was formerly abundant throughout the Mississippi Valley; the burrows of the latter animal are of sufficient size to readily admit the body of a small boy."

The Loveland specimen was recovered at a great depth beneath the surface but we are bound to raise the queries, Is it an implement? Was it in place; and what is the meaning of the dark soil found on its surface? Of the Newcomerstown specimen it may be said that the collector had little knowledge of the nature of the gravels and of the treacherous character of talus deposits, or of the importance or peculiar bearing of the find. There is, therefore, a most serious possibility of error. There is a decided chance that errors of observation may have crept in in all the cases.

And what is the story of the specimens themselves? The Madisonville object is to all appearances an ordinary reject of the flint-blade maker. It can be practically duplicated upon

almost any quarry-shop site. The pick-like object from Loveland is somewhat unique, and thus has a certain interest of its own, independent of the manner of its finding. At best, however, it was probably not a finished implement at all and there is strong evidence that it has never been used. It may not have more than a remote resemblance to any tool ever employed by the occupants of the valley. The Newcomerstown object appears to have a marked resemblance to certain foreign implements, but the Tuscarawas valley flint-shops furnish many other specimens whose analogies are nearly if not quite as close.

These specimens constitute the Ohio evidence. There is nothing more, for it would be a great mistake to present surface finds as "paleoliths" or as gravel art, no matter how close their resemblance to these or to European forms. It is safest to assign all to the historic Indian save those obtained and proved to have been obtained from the gravels in place.

These three specimens furnish the most satisfactory proofs, so far collected, that a glacial, paleolithic man inhabited the Ohio valley, and upon the evidence of these three slightly shaped stones, obtained from isolated localities, it has been proposed to carry the history of man back some thousands of years farther than can be done by any other means yet discovered.

No careful student will venture to say that the evidence furnished by the three specimens is satisfactory and conclusive. The finds are not demonstrably implements but have the characteristics rather of rejects of manufacture. Their employment as evidence of a *paleolithic stage of culture* serves only to emphasize the utter inadequacy of the available proofs on that point.

Considering the meagre and unsafe nature of these proofs, there seems little doubt that a *glacial man* for the Ohio valley has been somewhat prematurely announced and unduly paraded.

W. H. Holmes.